

ON ANTISEPTIC METHODS AND OTHER POINTS IN THE  
PRACTICE OF PROFESSOR VON VOLKMANN.

A residence of four months in Halle and a daily attendance at the clinic afford the writer the opportunity of submitting to the readers of the *ANNALS OF SURGERY* some account of the antiseptic methods employed by Professor von Volkmann, and a brief notice of some of the more striking points in the treatment of surgical cases, especially of fractures and diseases of the bones and joints, which that distinguished surgeon's genius and experience have led him to adopt, which, too, in many instances, have resulted in signal successes. That this notice confines itself largely to details, individually minute, but capable of yielding great results as a whole, is no ground for apology, but rather of justification. It is now recognized by all that the large measure of success which has followed bold operative procedures, and the proud position which surgery has attained, are due, not so much to mere manual dexterity, as to a thorough appreciation of what is known of the life history of micro-organisms, their universal presence, the remarkable facility with which they are capable of effecting an entrance into the economy, and the disastrous consequences, or, to put the question briefly, the exclusion of all possible sources of sepsis.

Although it is not permissible for the writer to enter into actual statistics, yet it is the boast of this clinic that, if patients have been treated from the first within its walls, in no single instance has pyæmia supervened after operation during the last six years. Pyæmia is not unknown here, but when it has occurred, it has been in those whose wounds were foul when they obtained admission. But even then it has been limited to the individual case, and has not spread; and during my residence here, it is possible for me to add, that erysipelas has been conspicuously absent. One reason of this is readily apparent. The dressing of cases is not entrusted to mere students, who are still learning the details of antiseptic practice while they are in actual attendance on patients, but to thoroughly trained assistants who are well acquainted with the necessary routine, and have also passed through a course of bacteriology.

The method adopted is one which, as far as the practical training of

the ordinary student is concerned, has many drawbacks, but it affords the greatest possible benefit to the patient. Students, as such, are not allowed to come in actual contact with the latter. They must attend the clinic daily and note the preparation made for operation day by day, and from time to time undergo a cross-examination in the routine of antiseptic practice, until the time arrives when some of them seek the position of *Voluntär-Arzt*, and later, of *Assistant*. These latter are chosen by the professor himself, and, after passing through the Out-patient Department where they apply all their lately acquired knowledge, pass on to the care of cases in the wards. Those students who cannot afford to wait for three or four years after their qualification must go into private practice with only a limited practical knowledge of the surgical part of their profession.

We will now follow the course of an operation so far as it concerns the limits of this article. And firstly, let us note the procedure of the operator himself and his assistants. Taking off their coats and rolling their shirt sleeves well above the elbows, they thoroughly wash their hands and the exposed parts of their arms with a special soap, a sand carbolic soap, which rapidly removes all traces of dirt, or of previous operations. The nails are then carefully attended to, and the nail brush and nail cleaner are in constant requisition. There is no more serious error than for a student to assist at an operation with imperfectly cleansed nails, and such must inevitably be the case when he is called upon, first, to expose his hands to the caustic action of the carbolic spray, and then to apply plaster-of-Paris jackets and splints. Here the latter duties are performed by a special set of assistants who are not, during their term of office, allowed to assist at operating.

A white calico dress is then donned, somewhat resembling those worn by visitors at fever hospitals. It reaches from the neck to the feet, has short sleeves, and generally buttons behind, the object of the latter precaution being to prevent access of the hands to the pocket, a habit which a moment of leisure irresistibly induces in some people ; it was remarked to me by a professor that pockets are usually mines of septic wealth. The calico dress is used for one day only, or for one case, if that should happen to be foul ; it is then sent to be washed.

The hands and arms are then allowed to soak for about half a minute in corrosive sublimate solution, 1 in 1000. This procedure involving time and labor and an appreciable risk of mercurial absorption, differs widely from the practice of merely washing the hands in a cursory manner, and then dipping them in a carbolic acid solution for a few moments, and the constant use of an old coat which has seen much service amongst all kinds of surgical cases, septic and aseptic—a practice in vogue not so long since in some large hospitals, amongst the students and dressers.

The preparation of the patient to be operated on is the next matter. The skin over a large area is first well washed with carbolic soap, and scrubbed if need be, and then it is shaved, the latter detail applying to all parts where hair is found, and not merely to the head, face and genitals. Then the skin is further freed from any adhering greasy material, such as sebaceous secretion, by rubbing with ether on lint, and finally undergoes a complete irrigation with sublimate solution.

The instruments are placed in a 5 % solution of carbolic acid for a few minutes previously. When not in use, they are kept in an air-tight glass case open to everybody's view and free from dust. The perchloride of mercury solution is not used for instruments, as a deposit of mercury readily forms on them, which leaves a black mark along the edge of the incision. Neither are they nickel plated to avoid this, the plan having been tried, but it proved to be a failure, as it was found the nickel readily chipped off, and so left irregularities which rendered them difficult to clean and very liable to lodge foreign matters. In the Frauen Klinik the knives for ovariotomy are similar to those used in bacteriological researches, the cutting part and the handle being made from one piece of steel.

One important point with regard to metallic and other catheters and sounds. They are always kept in a glass jar, containing a 5 % solution of carbolic acid in glycerine, and it is found that glycerine is a more reliable medium than oil, and answers all the lubricating purposes of the latter.

It is well, too, to note that when a catheter is to be passed, the interior of the prepuce and the glans and the meatus urethræ are care-

fully cleaned and irrigated with a solution of hydrarg. perchlor., 1 in 5000.

An enumeration of the antiseptics employed and their special uses can best be made here. Corrosive sublimate, 1 in 1000 for the hands of operator and assistants, and for cleaning the skin, also for irrigating the wound, provided it does not involve serous cavities or mucous surfaces, or is not of large extent.

For the former boracic acid solution 3 %, or salicylic acid  $\frac{1}{3}$  % is found appropriate, and in all cases involving the buccal and rectal mucous membranes. After an excision of the rectum the 1 in 1000 sublimate solution was employed, and the operation was followed by symptoms resembling the onset of acute peritonitis. At the autopsy there was no evidence of wound of the peritoneum, and no morbid changes were discovered sufficient to have caused death: so it was deemed quite within the range of probability that death was due to mercurial poisoning. Permanganate of potash solution (Condy's fluid) is never used, as it is of feeble germicidal power, and readily parts with such efficacy as it may possess. Carbolic acid solution 3—5 % is employed for instruments, sponges, 10 %, for wounds of large extent, and for cleansing foul sores, such as varicose ulcers. A very weak solution,  $\frac{1}{2}$ —1 % is sometimes employed for the peritoneal cavity and for hernia cases.

With regard to the sponges. There is a set for each day of the week, lying in a 10 % carbolic solution, in seven porcelain jars, and each day has its own appointed jar. In the morning the jar is placed in the operating theatre, and in the immediate vicinity is a tin box securely locked, with an aperture in the lid, and containing a 10 % carbolic acid solution. As the sponges are used they are dropped into the tin box, and so can only be used for one operation. When the day's work is over, an assistant unlocks the tin box, and taking out the sponges, thoroughly washes them in hot water, and replaces them in the jar from whence they were taken during the day. This jar is then put by until the corresponding day next week, the sponges lying all that time in the strong solution above mentioned. The same procedure is repeated every day.

In the course of an operation the wound is gently irrigated from time to time, especial care being taken to wash away blood clots. During an amputation at the moment of sawing the bone a gentle stream follows the track of the saw. The object of this is said to be to remove the bone dust formed, but, in the writer's opinion, it serves a better and less chimerical purpose. Of all instruments a saw is most difficult to ensure complete cleanliness in; it is almost inevitable that some debris will cling to the interstices between the teeth.

Such material will readily infect the medulla of the bone as it passes through, but by irrigation at that moment the danger is reduced to a minimum. This precaution will perhaps serve to explain the absence here of separation of a small sequestrum from the bony stump, which is not an infrequent complication of the treatment of amputation wounds.

Ligatures are made of silk and catgut, the latter having been soaked in juniper oil, which renders them tough but readily absorbable. Both kinds are kept in glass boxes and the various sizes on reels, the free end passing through an aperture on the side of the box, with the number of its calibre printed near the aperture. In the glass box is placed sufficient carbolic acid solution to cover the reels.

This is a simple and efficient plan, and serves to avoid delay which sometimes ensues, if the ligatures are kept in short lengths in a glass jar, and become entangled when wanted.

Drainage tubes are of pure rubber, and are kept in glass jars soaking in an antiseptic solution. In all operations the spray is discarded. It is found that all the cases do well without it.

A few words as to the dressings. The wound having been carefully cleaned and freed from blood clots, one or other of the following gauze materials is applied: carbolic gauze, or benzoic acid gauze 4%, and in the case of deep wounds, such as a lithotomy or an excision of the rectum requiring tamponing, iodoform gauze. In case of plastic operations, and when it is desirable to ensure primary union at the earliest possible date, green protective is applied.

The amount of gauze placed over the wound is small and only sufficient to cover it and about three inches of the surrounding skin, and above the gauze is placed moss.

Large pads are made from wald-moss in this way. The moss is gathered in the forests around Halle, and thoroughly freed from dirt by repeated washings in distilled water. It is then dried in ovens and sent to the clinic. There it is made into pads of sizes according to a definite scale, and finally flattened beneath the rollers of a mangling machine.

The moss-pad, which is always very large in proportion to the extent of the wound, overlapping it at least 4 or 6 inches in every direction, is firmly fixed by means of light loose-textured bandages, which are less expensive, and adapt themselves more readily, than those made from calico. Should the discharge find its way through the dressings, some iodoform is sprinkled on and another pad is bandaged on. The advantages of such a dressing appear to be, firstly: moss is a great absorbent of moisture, far more so than cotton wool, carbolic tow, Gamgee tissue and the like. In addition, when wet, it does not form a sodden mass like the substances above enumerated. Now, one of the main factors in the development of micro-organisms is the presence of moisture, and that substance which by the most rapid absorption will prevent discharge coming to the surface of the dressings, fulfils many of the requirements of a perfect dressing. Secondly, it acts as a filter, and filters off all micro-organisms from the air, in the same way as cotton wool in a test-tube cultivation, and, lastly, it is exceedingly cheap—an important consideration in the management of large hospitals. For carbolic gauze to answer the requirements of large absorptive capacity and filtration, it must be applied in layers of 16, 20, 24 thicknesses, on account of its loose texture and the paraffin which enters into its composition. Professor Volkmann's successful method of dressings rests on this fact. He has assured himself that he has left his wound and the *surrounding skin* for a large area perfectly free from septic, and then it is only necessary to provide such a dressing as will prevent contamination from without, and this is found in a small quantity of carbolic gauze, and a large amount of wald-moss.

The point which to my mind needs emphasis is, that not only the site of operation, but that all surrounding parts for a large area, should be germ-free all through the course of the case. Of what value is it to

pile on costly antiseptic dressings when by so doing you only form a moist chamber for the development of germs situated on the skin beneath them, and with ready access to the wound. The efficacy of the method used by von Volkmann is very great. In no case have I seen suppuration, nor has a case of erysipelas occurred during my residence here. After all, an operator must have assistants upon whom he can rely absolutely to carry out all these minute details in every case. If the assistants must be looked after by their chief, and so to speak, cross examined constantly by him, then the system is apt to break down, on account of the trouble and loss of time it involves, and in a large hospital with two regular operating days a week, and many operations on that day by different surgeons, each waiting his turn, time is an object.

There is, however, here, but little or no loss of time, as each assistant is ready to act his part as soon as the patient is brought in, while the professor proceeds with his account of the case. In a large teaching hospital, where students must be practically taught, the writer would advocate that a short course of bacteriology should form a part of the surgical curriculum, and that each student should put into practice what he has learned, first of all fully in the outpatient department, and finally in the ward. It is inevitable that all students are not equally reliable, and it is noticeable that outbreaks of erysipelas and pyemia are usually limited to one surgeon's beds and to one particular set of cases attended by one dresser. It may be that it is an old coat, or carelessness in washing hands that carries the contagion, but certain it is that there is some one attendant who has not grasped the fundamental principles of antiseptic surgery.

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